Development of floor system using Japanese cedar plank

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Wooden residential house is popular in Japan, while the percentage of using domestic lumber has been less than 30%. Recently, however, a new trend using regional lumber in urban area has been getting popular. It is pointed out that one of the features is called as the "exposed ceiling system". This is the system composed of planks with about 40mm thickness processed tongue-groove joint and completed by screwing them on beams. It is a good system on the point of an excellent design and workability that structure has also function of finishing. However, the shear resistance factor (SRF) has not been estimated and it is considered current method has a difficulty for achieving high SRF because of the slip between planks.

In this research, H-shaped fastener was developed for improving in-plane stiffness by preventing slip deformation between the planks at the initial stage so as to enhance SRF of this floor system. This fastener was designed as press-in type and to be easily driven into plank at construction site without harming the appearance of timber planks.

Full scaled shear test was performed by employing such floor test specimens of 1820 mm width, 2730mm height, as two typed current methods; i.e., hiding toe-screwed type in groove and flat-screwed type at the plank surface, as well as improved system with H-shaped fastener. Cyclic loading for each specimen was performed three times in each peak deformation. As a result, SRF of the current method was 0.6 and 0.8 respectively, while that of the improved system with one piece of H-shape fastener per 0.91m in one plank was 1.64 as shown in Table1.

Table 1 Test results and the estimated SRF.

Type of specimen			Toe screwd type	Sinked floor type	Flat screwed type	n-plane fastener typ
			T	S	F	FH
(1)	Py	(kN)	2.92	3.76	4.12	6.62
(2)	$Pu*0.2*\sqrt{(2\mu-1)}$	(kN)	2.19	2.46	2.96	5.87
(3)	$2/3\,(Pmax)$	(kN)	4.69	5.65	5.80	8.03
(4)	$P1/150$	(kN)	2.28	2.24	2.92	5.84
Po (kN)			2.19	2.24	2.92	5.84
S.R.F(Shear Resistance Factor)			0.61	0.63	0.82	1.64